

respectfully submitted that all of the presently pending claims are allowable, and reconsideration is respectfully requested.

Attached hereto is a marked-up version of the changes made to the claims by the current Reply Under 37 C.F.R. § 1.116. The attached pages are captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

Claims 1 to 20 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 5,176,122 ("Ito") in view of "Triac Control using the COP400 Microcontroller Family," National Semiconductor's COP, Note 6, February 1981 ("Note 6"). Applicants respectfully submit that the combination of Ito and Note 6 does not render obvious the claims as presently amended for the following reasons.

Amended independent claims 1, 7, 11 and 17 clarify the association between the piezoelectric element, the triac and the triac drive circuit. Claim 1 has been amended herein without prejudice to recite that the triac drive circuit is configured to drive the triac and that the triac is adapted to selectively charge and discharge the piezoelectric element. Claim 7 has been amended herein without prejudice to recite that the method includes driving a triac drive circuit to drive a triac to selectively charge and discharge the piezoelectric element. Claim 11 has been amended herein without prejudice to recite that the triac drive circuit is configured to drive the triac and that the triac is adapted to selectively charge and discharge the piezoelectric element. Claim 17 has been amended herein without prejudice to recite that the method includes driving the triac drive circuit to drive the triac to selectively charge and discharge the piezoelectric element. Support for the foregoing amendments may be found, for example, on page 12, lines 18 to 32 of the Specification.

Ito purports to relate to a fuel injection device for an internal combustion engine having a fuel injector. See Abstract, lines 1 to 2. Each fuel injector 5 is connected to the output port 26 via corresponding drive circuits 34. See col. 3, lines 42 to 45. When a charge is given to piezoelectric element 46 to stop fuel injection, the piezoelectric element 46 expands

axially. See col. 3, lines 59 to 62. When the charge of the piezoelectric element 46 is discharged to start the fuel injection, the piezoelectric element 46 is contracted. See col. 4, lines 1 to 3.

Ito does not provide any details of drive circuit 34 or output port 26, i.e., construction, configuration, specifications, etc. Indeed, nowhere in Ito, other than the introductions noted above, is there any discussion of either drive circuit 34 or output port 26. Rather, Ito merely states at col. 3, lines 42 to 45 that "[e]ach fuel injector 5 is connected to the output port 26 via corresponding drive circuits 34 and the high pressure fuel pump 8 is connected to the output port 26 via a drive circuit 36."

The Final Office Action contends, on page 2, numbered paragraph 3, that Ito discloses an apparatus for driving fuel injector elements (5) divided into a plurality of injector banks, each bank being selected for charging or discharging by a bank-selection switch (26). However, Applicants find no indication in Ito that output port 26, referenced by reference number 26 throughout Ito, is a bank-selection switch, as opposed to a port, as its name indicates.

The Final Office Action admits on page 2, numbered paragraph 3, that Ito does not disclose a bank selection switch which includes a triac with a triac drive circuit. Applicants respectfully request that the Office recognize that, not only does Ito not disclose the use of a triac, but that Ito does not disclose the use of a switch in communication with a drive circuit at all. It is noted that the terms "switch" and "bank" do not appear anywhere in Ito. Amended claims 1, 7, 11 and 17 recite relationships between the triac, the triac drive circuit and the piezoelectric element that are not disclosed, or even suggested, by Ito.

Note 6 purports to describe details regarding the COP400 single-chip controller family members. See Note 6, paragraph 1.0. This is supported by all the paragraph headings, including "1.0 Triac Control", "2.0 Software Techniques" and "3.0 Triac Light Intensity Control Code". Note 6 does not disclose, or even suggest, an apparatus or a method for driving piezoelectric fuel

injector elements. Nor does Note 6 disclose, or even suggest, fuel injector elements, triacs or triac drive circuits as recited in amended claims 1, 7, 11 and 17.

In rejecting a claim under 35 U.S.C. § 103(a), the Examiner bears the initial burden of presenting a prima facie case of obviousness. In re Rijckaert, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish prima facie obviousness, the prior art reference(s) must teach or suggest all of the claim limitations. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). As established above, the combination of Ito and Note 6 does not disclose, or even suggest, all of the limitations of amended claims 1, 7, 11 and 17. Nor is there any suggestion or motivation to modify or combine the disclosures of Ito and Note 6 in the manner contemplated by amended claims 1, 7, 11 and 17. There is no discussion in Note 6 to use the triac in conjunction with a triac drive circuit in connection with a fuel injector element, and there is no discussion in Ito of a triac, or a any switch at all, in conjunction with a piezoelectric element.

Accordingly, there is no evidence that the references relied upon, whether taken alone, combined or modified, would provide the features and benefits of amended claims 1, 7, 11 and 17. It is therefore respectfully submitted that amended claims 1, 7, 11 and 17 are allowable for these reasons.

The Final Office Action states on page 5, numbered paragraph 10 that the test for obviousness is not (a) whether the features of the secondary reference may be bodily incorporated into the structure of the primary reference, or (b) that the claimed invention be expressly suggested in any one or all of the references. Rather, the Final Office Action states that the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. It is clear from the above arguments that Ito and Note 6 would not have suggested to one of ordinary skill in the art at the time the apparatus and method recited in claims 1, 7, 11 and 17 were made the use of a triac with the fuel injection device of Ito. Simply stated, Ito does not disclose, or even suggest, the use of a switch in combination with drive circuit 34, and Note 6 does not

disclose, or even suggest, a triac in combination with a fuel injection device.

As for claims 2 to 6, which ultimately depend from claim 1 and therefore include all of the limitations of claim 1, claims 8 to 10, which ultimately depend from claim 7 and therefore include all of the limitations of claim 7, claims 12 to 16, which ultimately depend from claim 11 and therefore include all of the limitations of claim 11, and claims 18 to 20, which ultimately depend from claim 17 and therefore include all of the limitations of claim 17, it is respectfully submitted that the combination of Ito and Note 6 does not render obvious these dependent claims for at least the same reasons given above in support of the patentability of claims 1, 7, 11 and 17. In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1998) (any dependent claim depending from a non-obvious independent claim is non-obvious).


In light of the foregoing, Applicants respectfully submit that claims 1 to 20 are currently in condition for allowance. Prompt reconsideration and allowance of the present application are therefore earnestly solicited.

Respectfully submitted,

KENYON & KENYON

Dated: 3/10/03

By:

 (62)
Richard L. Mayer
Reg. No. 22,490

One Broadway
New York, New York 10004
Telephone: (212) 425-7200

CUSTOMER NO. 26646

PATENT & TRADEMARK OFFICE

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 1, 3, 7, 11 and 17 have been amended without prejudice as follows:

1. (Amended) An apparatus for driving piezoelectric fuel injector elements divided into a plurality of injector banks, each bank containing at least one piezoelectric element (10, 20), each bank being selected for charging or discharging by a bank-selection switch (S1, S2, S3, S4, S5, S6), characterized in that a bank selection switch includes a triac [with] and a triac drive circuit (312) configured to drive the triac, the triac adapted to selectively charge and discharge the piezoelectric element.

3. (Twice amended) The apparatus as defined in claim 2, characterized in that the triac drive circuit includes [is driven by] two transistors.

7. (Amended) A method for driving piezoelectric fuel injector elements divided into a plurality of injector banks, each bank containing at least one piezoelectric element, each bank being selected for charging or discharging by a bank selection-switch, characterized by driving a triac drive circuit to drive a triac to selectively charge and discharge the piezoelectric element.

11. (Amended) An apparatus for driving a plurality of piezoelectric fuel injector elements assigned to a plurality of injector banks, each injector bank including at least one piezoelectric fuel injector element, comprising :

a bank-selection switch corresponding to each injector bank and configured to be selected to one of charge and discharge the corresponding injector bank, each bank-selection switch including a triac and a triac drive circuit configured to drive the triac, the triac adapted to selectively charge and discharge the piezoelectric element.

VERSION WITH MARKINGS TO SHOW CHANGES MADE

17. (Amended) A method for driving a plurality of piezoelectric fuel injector elements assigned to a plurality of injector banks, each injector bank including at least one piezoelectric fuel injector element, comprising the steps of:

selecting each injector bank for one of charging and discharging by a bank selection-switch corresponding to a respective injector bank, the bank selection-switch including a triac and a triac drive circuit; and

driving the triac drive circuit to drive the triac to selectively charge and discharge the piezoelectric element.